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Features and Technology

OBJECTIVES

After completion of this module you will be able to:

- Familiarize yourself with some of the technology in BMW vehicles
- Be able to set the correct time, date and radio stations on all BMW models
- Familiarize yourself with the different sound and navigation systems on all BMW models

Introduction

BMW defined the sports luxury vehicle division. Over the years other automobile manufacturers have tried to obtain some of the market share originally held exclusively by the BMW.

Other manufacturers have copied our designs, handling characteristics, and even our marketing styles, but BMW continues to be the benchmark for setting standards. For BMW to maintain its leadership position in this category it requires innovative design concepts and technology.



BMW Group Research and Innovation Center (FIZ)

BMW World and BMW Group Corporate Headquarters



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This section is intended for new center personnel as an overview of some of the technology behind BMW vehicles. Specific information on these systems discussed in this section can be found in TIS under Technical Training Information.

The topics are divided into three major sections which are:

- Drivetrain
- Chassis/Suspension
- Body Electronics

Design

The Roundel

The most recognizable of all BMW design elements is its distinct logo, known as the Roundel. Seen from a distance, even as a blur, the blue-and-white propellers of the Roundel signal that you're in the presence of greatness. With its colors deriving from the Bavarian flag and the propeller motif symbolizing BMW's origins as a manufacturer of aircraft engines, the Roundel expresses the pride and sense of tradition that go into the design of every BMW.



Quad Headlights

The four round headlights or "eyes" of the BMW represent one of the most recent BMW design elements. They first emerged with the six-cylinder 320i and 323i as a rank marker designed to distinguish them from "lesser" 3s that sported only two headlights. By the late 1980s, the four-eyed look had become the norm for most BMWs and remains a distinctive marker today.

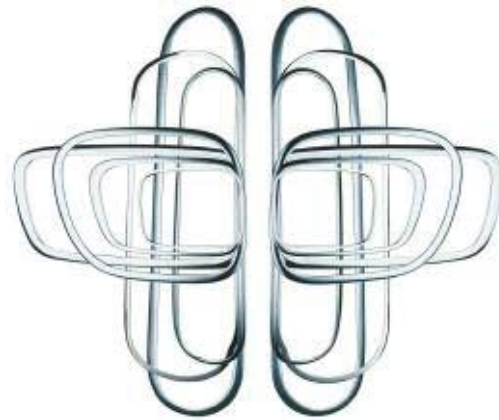


Optimum Weight Distribution

All current BMWs have their front wheels relatively far forward and their engine as far back as practical. BMW even positions the battery toward the rear of the vehicle to distribute its relatively heavy weight. The resulting weight distribution comes within 3.3% of the ideal 50/50 balance, far closer than most cars deliver. BMW fore-aft weight balance aids handling during braking, cornering and accelerating. Optimum balance for optimum performance.

Kidney Grills

One of the most visible of BMW design elements, often seen rising up in rear-view mirrors, is the traditional "kidney" grille. Introduced at the 1933 Geneva auto show, the distinct shape of the kidneys first emerged from an effort to reduce aerodynamic drag. Over time, they have evolved from tall ovals into their now-emblematic low, wide kidney-like shape. They continue to symbolize the timelessness of BMW design and engineering.



Hofmeister Kink

Certainly the BMW element with the most unusual name is the Hofmeister kink, the distinctive bend in every BMW's C-pillars (the metal roof supports that separate the rear side windows from the back glass). Although it appeared as early as the 1930s, the kink formally debuted with the "New Class" 1500 Sedan at the 1961 Frankfurt auto show and was named after Wilhelm Hofmeister, then director of design for BMW. Aside from its pleasing visual effect, the Hofmeister kink subtly highlights a BMW trademark: rear-wheel drive.



Aerodynamic Design

The mantra of BMW design is "form follows function." For example, the integrated front spoiler on all BMWs reduces the amount of air flowing under the car, hence minimizing front-end lift at speed. The very shape of BMWs is a result of precise aerodynamic engineering. Each closed-body BMW has been designed for a low drag coefficient. With air flowing smoothly over the body, the engine has less drag to overcome. BMWs are also designed to minimize aerodynamic lift. Thus the legendary cornering and road-hugging agility of The Ultimate Driving Machine®.

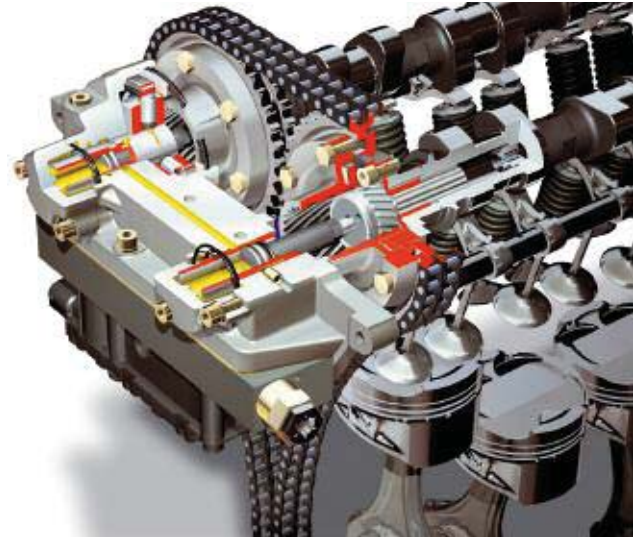
Drivetrain

VANOS

VANOS is a combined hydraulic and mechanical camshaft control device managed by the vehicle's engine management system. VANOS was introduced for the US in 1992 on the 5 Series equipped with a M50B25 engine.

VANOS significantly enhances emission management, increases output and torque, and offers better idling quality and fuel economy.

The VANOS system is based on a mechanism that can modify the position of the intake camshaft relative to the crankshaft. Double-VANOS adjusts both the intake and exhaust camshafts.



VANOS operates on the intake camshaft in accordance with engine speed and accelerator pedal position.

- At the lower end of the engine-speed scale, the intake valves are opened later, which improves idling quality and smoothness.
- At moderate engine speeds, the intake valves open much earlier, which boosts torque and permits exhaust gas re-circulation inside the combustion chambers, reducing fuel consumption and exhaust emissions.
- At high engine speeds, intake valve opening is once again delayed, so that full power can be developed.

An advantage of double-VANOS is that the system controls the flow of hot exhaust gases into the intake manifold (EGR valve function). This is referred to as "internal" exhaust gas re-circulation, allowing small amount of exhaust gas to be recycled.

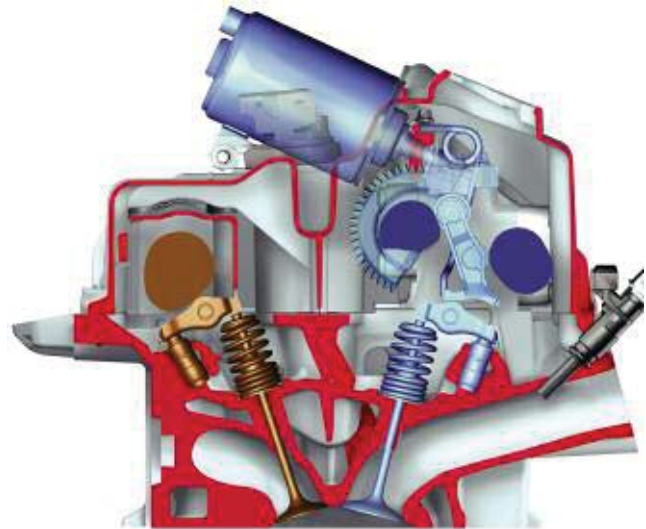
Valvetronic

Valvetronic was introduced in the US on the MY2002 E65 7 Series vehicle equipped with the N62B44 engine.

Valvetronic engines use a combination of hardware and software to eliminate the need for a conventional throttle mechanism. A Valvetronic engine replaces the function of the throttle butterfly by using the amount of valve lift to regulate the amount of air entering the combustion chamber.

The valves are of a conventional design, but the intake camshaft uses a secondary eccentric shaft with a series of levers and roller rockers, activated by a motor. The motor moves the eccentric shaft and varies the position of the pivot point of the rocker thus changing the amount of valve lift achieved.

The Valvetronic feature requires its own computer (separate unit) apart from the engine management system but is networked to the engine control module by the use of a high speed CAN bus.



Benefits:

- Valvetronic reduces maintenance costs, improves cold start behavior, lowers exhaust emissions, and provides a smoother running engine. Valvetronic does not need specific fuel grades or fuel qualities because of its fine atomization of fuel.
- Because Valvetronic allows the engine to breathe more freely, fuel consumption is reduced by 10%. The fuel savings are greatest at lower engine revolutions and allow for decreased engine emissions.

At light throttle, the throttle butterfly partially or even nearly closes. The pistons are still running, taking air from the partially closed intake manifold. The intake manifold between the throttle and the combustion chamber has a partial vacuum, resisting the sucking and pumping action of the pistons, wasting energy. Automotive engineers refer to this phenomenon as "pumping loss". The slower the engine runs, the more the throttle butterfly closes, and the more energy is lost.

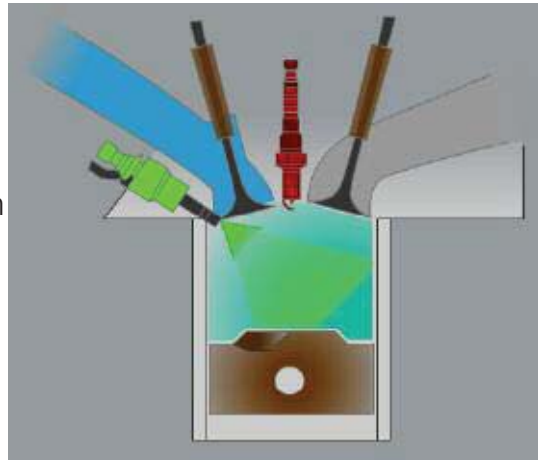
Valvetronic minimizes pumping loss by reducing valve lift and the amount of air entering the combustion chambers.

- In Valvetronic engines coolant flows across the head, resulting in a temperature reduction of 60%. The water pump size is cut in half, reducing power consumption by 60%.

Direct Injection

The term “direct injection” refers to a fuel injection system which injects fuel directly into the combustion chamber rather than into the intake manifold. This technology has been around since the 1930’s, but has not been in widespread use until the late 20th century. The first passenger car to run on direct engine was a car called the “Gutbrod” in 1952.

The first application of this technology on a BMW was in 2003 on the 760Li. The N73 V-12 engine utilizes the latest direct injection technology combined with Valvetronic.



For the 2007 model year, BMW has introduced a 6-cylinder engine with direct fuel injection. The N54, which is turbocharged, uses the second generation of direct injection (DI 2), which is referred to as High Precision Injection (HPI).

As the name suggest, the direct injection (DI) system use a fuel injector which sprays fuel directly into the combustion chamber. The fuel injection pressure (N73) is from 80 to 120 bar. The A/F mixture in a DI engine is formed inside of the combustion chamber.

In comparison, a manifold injection system sprays fuel into the intake manifold or into the intake port near the intake valve. In this case, the A/F mixture is formed outside of the combustion chamber. The injection pressure on most manifold injection systems is between 3 and 5 bar.

The DI system allows for increased engine efficiency and has several distinct advantages over manifold injection systems:

- The fuel is evaporated and atomized in the combustion chamber, which provides a “cooling effect” on combustion. A cooler combustion chamber allows an increase in air density, which allows for more available oxygen. In addition, cooler combustion allows for an increase in compression ratio which equates to improved efficiency and engine power.
- By injecting the fuel directly into the combustion chamber, there is less possibility for fuel to condense or accumulate on the manifold walls or the back of the intake valve. This results in less fuel needed to achieve the desired A/F ratio.
- The increased injection pressure causes the fuel droplet size to be reduced. This allows for improved atomization and therefore improved mixture formation.

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Chassis and Suspension

AFS/AL

Active Front Steering (AFS) or Active Steering (AL) was introduced on the E60 5 Series models as part of the Sport Package.

AFS varies the steering transmission ratio electronically in direct relation to the style and speed of driving and road conditions.

AFS is different than variable assist power steering, which only varies the amount of effort, not the actual steering ratio.

Benefits:

- At low and medium speeds, the steering becomes more direct. This requires less turns of the steering wheel and increases the car's agility in city traffic or when parking.
- At high speeds the steering becomes less direct offering improved directional stability. When cornering at high speeds, or when undertaking sudden movements, the steering wheel will require more input to make the wheels turn.
- AFS works in conjunction with Dynamic Stability Control (DSC) by monitoring the yaw rate and changing the steering angle accordingly. This reduces the number of DSC interventions, providing more control to the driver and increased comfort for the passengers.

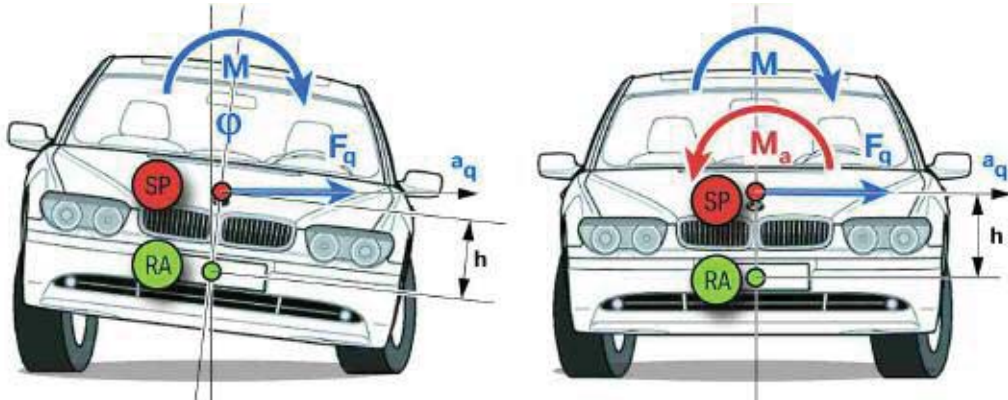
AFS works by inserting an electric motor with a worm gear drive that drives a planetary gear set located between the steering rack and the steering column.

When the steering wheel angle sensor detects driver input, the AFS control unit registers the data and then powers an electric motor to increase mechanical advantage in terms of rotation amount and turns the front wheels at more or less turns than the driver input. At lower speeds the system dials in a more direct steering ratio allowing a small movement of the steering wheel to result in a greater movement at the road wheels.



ARS

Active Roll Stabilization winds up the stabilizer bars in the front and rear suspension to resist body lean while cornering. Because the system is actively controlling only when needed, the spring rates and stabilizer bar stiffness are reduced. This results in a smoother ride.



This system consists of:

- Active anti-roll bars, replacing conventional mechanical (“passive”) front and rear bars. Each bar consists of left and right portions, twisted in opposite directions by a hydraulic motor between them.
- Valve/sensor block containing various system valves and sensors.
- Lateral-acceleration sensor to detect how hard the vehicle is cornering.
- Electronic control unit (ECU) regulating the entire system.
- Tandem oil pump which, via its two sections, provides hydraulic pressure for ARS and the power steering.

Whenever the vehicle enters a corner or begins an avoidance maneuver, “lateral acceleration” is generated. This is read by the sensor, which transmits a signal to the control unit which processes this signal and transmits it to the valve/sensor block. The valve block determines the hydraulic pressure applied to the active anti-roll bars to control body roll.

The key word here is “active.”

Active Roll Stabilization:

1. Generates resistance to body roll by twisting the front and rear anti-roll bars.
2. Stronger and more highly “tailored” than can conventional anti-roll bars.
3. Does not offer resistance to bumps in as do conventional anti-roll bars.
4. Increases the vehicle’s maximum cornering capability.
5. Improves steering response, particularly in the range of cornering where body roll is most tightly controlled.

Tire Pressure Monitoring

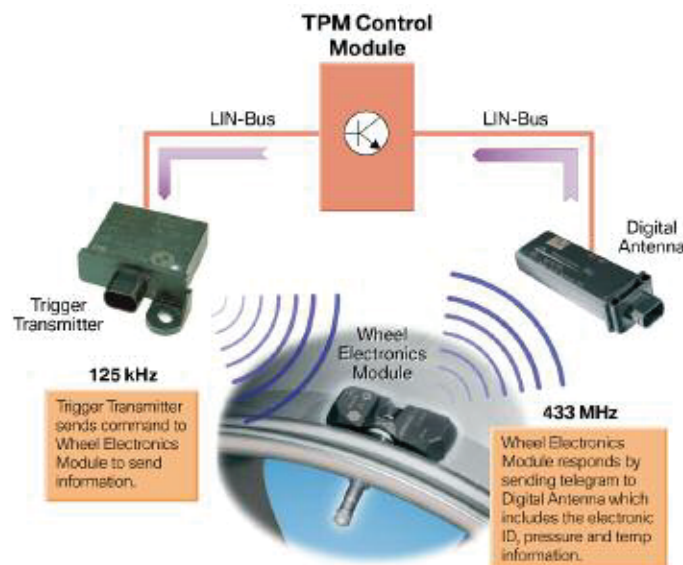
System Identification and Terminology

In order to accurately diagnose TPM systems, the system must be properly identified. These systems have had numerous acronyms which are used to describe the various systems. For the purposes of this training module, the systems will be broken down into two basic configurations.

These are as follows:

- **Systems which monitor wheel speed** - These **“Indirect”** systems will be referred to as Flat Tire Monitoring systems or FTM. FTM systems take advantage of components already installed in the vehicle. The wheel speed sensors, which are already an input to the DSC control unit, are used to monitor wheel speed. When a tire starts to deflate, the overall diameter changes. This affects the rotational speed, which is picked up by the DSC module. The DSC module contains software for the purpose of calculating the speed changes and reporting the pressure loss to the driver via an illuminated indicator or symbol. The only additional components which are installed is the switch for system initialization. Early generation systems used a module which received wheel speed input from the DSC module.
- **Systems which monitor actual tire pressure** - These **“Direct”** systems will be referred to as Tire Pressure Monitoring Systems or TPM systems. TPM systems use wireless sensors which are part of the tire valve stem. These sensors monitor actual tire pressure and send this information to a module via multiple antennae. These systems are preferred due to the fact that the actual tire pressure is monitored rather than by variations in tire rotational speeds.

There is a simple way to identify the difference between the two systems. On systems which monitor actual tire pressure, the tire valve stem is threaded and has a “hex head” on the valve stem. The systems which monitor wheel speed have conventional rubber valve stems.



In 2000, there was much media attention surrounding tire safety issues. The leading tire manufacturers were involved with many law suits regarding catastrophic tire failures. These well publicized incidents involved injury and fatalities.

In response to these issues, the U.S. Congress enacted legislation entitled the “Transportation Recall Enhancement, Accountability and Documentation (TREAD) Act in November of 2000.

The TREAD Act encompasses many aspects of tire industry issues. The act includes items such as tire labeling requirements, tire testing standards, information on tire safety related recalls etc. There are also provisions for issues on child safety restraints.

However, the focus of this training module is to train technicians about Tire Pressure Monitoring Systems (TPMS). TPM systems are also one of the primary components of the TREAD Act. TPM systems allow early detection of tire pressure loss which is not usually detected by the driver until vehicle handling and safety is affected.

The National Highway Traffic Safety Administration (NHTSA) is the government agency responsible for the creation and enforcement of the mandates of the TREAD Act. Initially, NHTSA approved the installation of “Indirect” TPM systems.

Indirect TPM systems monitor tire pressure “indirectly” by monitoring the rotational speed of the tire via the wheel speed sensors. The ABS/DSC system can then detect pressure loss by comparing wheel speed information between all 4 tires. Any loss in tire pressure would result in a change in tire diameter and therefore a change in rotational speed.

The guidelines of the TREAD Act found that “Indirect” TPM systems are ineffective in detecting tire pressure loss until the tire was under-inflated to an unsafe level. Therefore, NHTSA mandated that auto manufacturers install “Direct” TPM systems on all vehicles.

Direct TPM systems monitor tire pressure directly by using pressure sensors at each wheel which report tire pressure and temperature information to relevant vehicle systems. Tire pressure loss is then reported to the driver via an illuminated warning symbol. Direct TPM systems also offer the capability of monitoring tire pressure when the vehicle is at a standstill. Indirect systems must be driven in order to collect sufficient data to detect tire pressure loss.

As per NHTSA guidelines, passenger cars and light trucks must have the “Direct” TPM systems installed via a specific timeline from 2005. By 2007, all auto manufacturers must be in 100% compliance.

Aside from the obvious safety benefits, Direct TPM systems will also assist the driver by maintaining fuel economy and extending tire life.

This training module will help the technician to diagnose and repair both “Indirect” and “Direct” TPM systems. The first step in the diagnosis the these systems is identification. The following text shows some tips on identifying these systems.

xDrive

BMW's "intelligent" all-wheel drive system was introduced on the E83 and E53 9/2003 production. It is now available on current all wheel drive versions of BMW models.

BMW caters to the needs of customers that desire vehicles with exceptional handling and performance while driving in snow/winter conditions by offering xDrive all-wheel drive.



Operation of xDrive:

- Driving torque is always transmitted to the rear wheels. At least 50% of the torque is always sent to the rear wheels.
- The portion of torque that is transmitted to the front wheels is achieved by a multi-disc clutch. This clutch assembly can be fully open, fully engaged or at any level of partial engagement in between. At full engagement the torque split to the front and rear wheels is exactly half.
- Engagement pressure on the multi-disc clutch is directed by an electronic control system in response to actual road and driving conditions.

The purpose of xDrive is not just to optimize traction; it can also enhance both handling performance and stability on dry as well as slippery road surfaces.

The xDrive system is incorporated into the DSC logic. The DSC system utilizes the xDrive transfer case to compensate within physical limits for excessive oversteer and understeer. xDrive adjusts the front/rear torque distribution to avoid these tendencies.

If an oversteer condition is sensed, the multi-disc clutch engages, sending the maximum possible torque to the front wheels; thus making the vehicle take on front wheel drive characteristics.

If an understeer condition is detected, the clutch disengages completely, sending 0% of the driving torque to the front wheels.

Under normal operating conditions, the vehicle torque split is 60% rear and 40% front with few exceptions.

Dynamic Stability Control

DSC encompasses three functions that aid in traction control:

- Anti-Lock Braking System (ABS)
- Automatic Stability Control (ASC)
- Dynamic Stability Control (DSC)

Features:

■ Traction Control

Controls engine power and the brakes to limit wheelspin and thereby improve the driver's control of the vehicle under conditions where a wheel or wheels might spin, primarily on slippery roads. The DSC system continually processes data from the wheel-speed sensors. Anytime a drive wheel begins to lose traction (rear wheels on most models, any wheel on AWD models), the system senses this and acts on the engine's throttle(s) or Valvetronic and ignition timing to reduce engine torque. It also acts on each brake individually as necessary to help bring wheelspin under control, enhancing driving stability on slippery surfaces (or even on dry roads under extreme acceleration or cornering).

BMW's traction control is an all-speed system. Engine intervention is possible at any speed.

Below 25 mph, the brakes are also applied selectively and separately as necessary to optimize traction very quickly. Between 25 and 50 mph, the rear brakes are applied as a pair. Above 50 mph, traction control operates entirely through engine intervention.

■ Dynamic Traction Control (DTC)

It has always been possible to de-activate Dynamic Stability Control functions (except antilock braking) via a console switch. In all RWD models except M models, a capability called Dynamic Traction Control is also incorporated.

DTC improves utilization of available road traction under specific conditions:

- on sand, gravel, deep snow or packed snow.
- climbing hills with deep or packed snow.
- when there is deep snow on only one side of the road.
- when driving with tire chains.

The driver may either fully de-activate DSC (except ABS) or activate the DTC mode. In the 3, 5, 6 and Z4 Series, DTC is selected via a brief push on the DSC console switch; full de-activation of DSC requires a longer (2 sec.) push on the switch. In the 7 Series, DTC selection is via iDrive. Even with DSC de-activated, ABS always remains functional.



■ **Electronic Brake Proportioning**

Anytime the brakes are applied, a vehicle's front end becomes more heavily loaded; the rear "gets lighter." To deal with this, front-to-rear proportioning of braking force is varied according to braking severity.

Via the wheel-speed sensors, EBP actually measures the slip at each wheel when the brakes are applied, and regulates pressure accordingly to the front and rear brakes. Braking force is thus apportioned optimally at all times, making best use of available braking traction at the tires and helping distribute brake and tire wear more evenly.

■ **Antilock Braking (ABS)**

During braking, anytime a wheel begins to lock up (slide), DSC releases and re-applies (cycles) the individual wheel brakes to prevent this from occurring. As only a rotating tire can deliver effective braking power to the road, the antilock function helps the driver achieve quick, controllable deceleration or stopping when necessary, helping avoid skidding.

■ **Dynamic Brake Control**

Reinforces the driver's brake-pedal effort in emergency braking. The system recognizes when the driver has made a "panic" brake application, and increases the level of assistance. By forcing the ABS to function optimally, this helps ensure that the most effective braking is achieved.

Cornering stabilization. For this most sophisticated DSC function, the following inputs are employed:

- The wheel-speed sensors
- A steering-angle sensor (measures turning of the steering)
- A lateral-acceleration sensor (measures how "hard" the vehicle is cornering)
- A yaw sensor (measures the vehicle's rotation around its vertical axis)
- A brake-pressure sensor (informs the system of any application of the brakes by the driver)

Together, these sensors precisely measure the vehicle's cornering motion. With their inputs feeding into the powerful DSC microprocessor, the system detects any deviation from the normal cornering path (abnormal understeer or oversteer) and gently regulates the vehicle into a controlled situation.

The following key features appear in more than one BMW Series:

BMW features applies individual wheel brakes to help the driver keep the vehicle on the intended path. Thus in these critical situations, when the driver may be attempting a maneuver beyond the normal control range of the vehicle, he or she is more likely to retain control and avoid an accident.

Although it obviously affects the vehicle's handling, this function should be considered primarily a safety feature; in other words, it should not be interpreted as a feature that allows faster cornering or more abrupt maneuvers.

■ **Hill Descent Control (AWD models only)**

Helps the driver maintain speed and stability on steep downhill runs. The driver needs only to press a dedicated button on the console; HDC takes over, gently applying the brakes as necessary to keep the speed to a brisk walking pace.

■ **Brake Fade Compensation**

“Brake fade” is the loss of effectiveness when brakes heat up under hard use. When this occurs, a given degree of deceleration requires more pressure on the brake pedal. As brake temperature rises, Brake Fade Compensation automatically increases the hydraulic pressure in the brake system relative to pedal application, so the driver does not have to press harder on the pedal.

■ **Brake Standby**

When the driver lifts off the accelerator pedal abruptly, DSC recognizes that sharp braking may be about to occur and applies just enough pressure in the brake system to snug up the pads against the rotors. Thus when the driver's foot reaches the brake pedal, the short “time lag” normally resulting from bringing the pad to the rotor is eliminated. Actual braking sets in more quickly; the reduced stopping or deceleration distance could reduce the likelihood of an accident.

■ **Brake Drying**

Acting on input from the windshield wipers' rain sensor, the pads are periodically brought up to the rotors – just enough to eliminate any film of water between pads and rotors, but not enough to cause any brake application.

■ **Comfort Stop**

Especially with automatic transmissions, unless the driver consciously eases off on the brake pedal, a jerk can occur as the vehicle comes to a stop. Comfort Stop automatically eases off, making for smoother stops.

■ **Start-off Assistant**

Similar in part to the 7 Series' Automatic Hold function, this function keeps the vehicle from rolling backward when stopped facing uphill. The driver can then start up without doing a ballet with the clutch, brake and accelerator (manual transmission) or doesn't have to hold the accelerator or brakes while stopped on a hill (automatic transmission).

M Differential

The main distinction between a conventional limited-slip differential and the M Variable Differential Lock is that where the former senses torque, the latter senses wheel speed (rpm). Under dry to not-quite-dry road conditions, the 25% limited-slip has traditionally enhanced the handling of sporty rear-wheel-drive BMW's; yet under slippery conditions, this differential type has limited ability to improve traction. In particular, this limitation applies when one wheel is on slippery, the other on firmer ground; it cannot transmit more torque than the slippery side permits.

On all current BMW models, electronic traction control (a function of Dynamic Stability Control, nearby) addresses this issue, although not in a manner conducive to sporty, M Car-style driving.

The M Variable Differential Lock specifically addresses low- and split-traction situations in a way that reinforces sporty handling, imparting to the M3 a slippery road ability no high-performance, rear-wheel-drive sports car ever before had.

Any time a speed difference develops between the two rear (driven) wheels, a shear pump, driven by this difference, develops pressure in the unit's silicon viscous fluid. This pressure is directed to a multi-disc clutch that transfers driving torque to the wheel with the better road grip ("select high"). The greater the speed difference between the two wheels, the harder the clutch engages. As this difference in wheel speeds diminishes, the clutch begins to ease off.

This mechanism accomplishes sophisticated action by entirely natural means. There is no external pump, no external source of lubrication or operating fluid. The very motion to be controlled – differences in speed between one wheel and the other – generates its locking action.

Viscous fluid is so-called because it develops internal force (via an increase in viscosity) whenever it is sheared; this is why the relatively small difference between one wheel speed and the other can generate the necessary action.

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Body Electronics

Bluetooth

Bluetooth technology uses radio frequencies, instead of wires, to connect various electronic devices to each other. This allows you to connect your computer, keyboard and mouse; share addresses between your PDA & laptop, and send music from your MP3 player to your wireless headphones. This versatile feature can also wirelessly connect compatible mobile phones to vehicles for hands-free calling. With a Bluetooth mobile phone, drivers can make and answer calls, as well as browse and select phone book entries, just by using the multifunction steering wheel controls and radio keys.



Do I need to add a special antenna or cradle for Bluetooth and what is the range for staying connected between the phone and the vehicle?

New BMW's that come factory-installed with Bluetooth capability do not require a special cradle. The phone can be kept in your vehicle's glove box, trunk or even in your pocket – anywhere within a 30-foot radius of the vehicle, depending on the power of your Bluetooth device, signal interference, or objects that might be between the phone and the vehicle's Bluetooth antenna.. Please note that docking cradles providing phone security, battery charging and improved antenna connection are available for selected phone models.

Certain 2003 and 2004 BMW's can be retrofitted with Bluetooth as a BMW center-installed accessory. This requires using a special, console cradle. For costs and more details, see your BMW center.

Can I access my mobile phone phonebook entries in the vehicle?

After the initial pairing procedure is completed, your phonebook contacts will automatically download to the vehicle's hands-free system. Any changes you make in your phone's phonebook will be automatically updated in the vehicle when the phone connects to the hands-free system. If more than one phone is paired to the vehicle, individual phonebook information will be used for each phone. For added protection, the contact information will only be available in the vehicle when the phone is connected to the hands-free system.

How secure is the Bluetooth connection between my mobile phone and the vehicle?

To protect your privacy, the BMW Bluetooth hands-free system requires a Bluetooth Passkey code to pair a mobile phone. This Bluetooth Passkey must be entered only once during the initial pairing procedure. To reduce the risk of interference or interception, Bluetooth wireless technology hops communication frequencies 1,600 times per second. In addition, BMW provides encryption to further protect the privacy of your calls.

iDrive Concept

Contemporary automobiles and particularly contemporary luxury automobiles – pose an ever-growing challenge to their designers: how to accommodate the extensive functions that modern technology offers without overwhelming the driver and creating a driving environment cluttered with controls.

iDrive is BMW's solution to this challenge. BMW has applied the Navigation System's proven concept: a color monitor with control menus, and a controller.



More functions than ever are controlled in this manner, and the controller has migrated from the monitor panel to a central position between the front seats. This controller acts like a “fixed position mouse” that controls the menus located in the control display or central information display (vehicle dependent). The controller is equally accessible to the driver and front passenger, and is finished in satin aluminum.

There are two different versions of the controller.

- One controller includes force feedback: According to the functions it is controlling, it gives the user an appropriate tactile feedback.
- The other controller has fixed notches and provides no force feedback. It's operation of the CD/CID is the same.



Digital Radio Sources



BMW Group will introduce HD Radio Technology developed by the iBiquity Digital Corporation starting with the 9/2005 production 7 Series.

iBiquity Digital is the sole developer of HD Radio technology. This technology is approved by the FCC for the US market. This company does not actually produce radios nor audio equipment. They are responsible for licensing this technology for use in the radio industry.



The benefits to digital radio are:

- AM will sound like present day FM
- FM will have compact-disc-like quality
- Improved Fidelity
- Free programming (only cost is for IBOC receiver)
- Supplemental Program Services (SPS) - Station ID, Title, Artist, Album, Genre, etc.
- Improved Reception (depending on digital data received)
- Analog to Digital (Digital to Analog) switching depending on reception quality
- From March 2007 Multicasting is available on some models

The HD Radio technology used in our IBOC control unit practically transparent to the user in terms of tuning.

IBOC is the acronym for In-Band On-Channel. This signifies that the location for the digital radio signals can be found in the exact same location on the “dial” as the analog signals. FM101.1 in the “analog realm” is also FM101.1 in the “digital realm.”

Initially, radio station broadcasting with iBiquity Digital’s HD Radio technology broadcasts two signals in the same frequency range. One signal is analog with an 8 second delay and the other is digital. This is known as “Hybrid Mode.”

Eventually the radio stations will stop transmitting in “Hybrid Mode” and will go to purely digital. The time frame is not yet established.

Sirius Satellite Radio

BMW offers our customers the latest in radio technology. The 3, 5, 6 and 7 Series can be factory equipped with the system; these models are also available with factory preparation for SIRIUS installation by BMW Centers.



SIRIUS delivers 120 channels of the best in digital entertainment coast-to-coast. 65 of these channels are 100% commercial-free music, featuring multiple categories as widely varied as hip-hop and classical. 50 further channels are devoted to news, sports and entertainment from content partners such as NASCAR, ESPN, Fox News, NPR, CNN Headline News and Radio Disney. And as the official Satellite Radio Partner of the NFL, SIRIUS leads in live sports on satellite radio, offering the entire NFL every week and up to 40 live NHL games per week.

SIRIUS channels are delivered by three powerful satellites for seamless coverage anywhere in the continental U.S., and optimized for superior sound resolution by proprietary S>PLEX technology.

Hardware for the vehicle consists of:

- a SIRIUS Satellite Receiver
- a Satellite Antenna
- a SIRIUS-compatible audio system

Once the equipment is installed and activated, the customer simply selects the satellite radio mode (example: AM/FM/CD/Satellite). As with FM and AM, users will be able to scan and set their favorite presets. The audio display can show the channel name, channel number and (in the case of music channels) artists and music title.

BMW ASSIST

The BMW Assist system incorporates an integrated wireless telephone with advanced digital and analog service plus a Global Positioning System (GPS) satellite receiver to determine your vehicle's location. Combined, they enable BMW Assist to enhance the BMW driving experience.

With BMW Assist, the customer will feel prepared and protected 24 hours a day, 7 days a week in the case of situations they may find.

The features of ASSIST can be broken down into three main categories:

- Safety Plan (core program)
- Convenience Services (optional; requires Safety Plan)
- Options

Safety Plan

(Standard on 2007 5, 6, & 7 Series and with option code 639)

To make a safety service request simply press the "SOS" button. This transmits the vehicle location and information. A specialist responds via the hands-free telephone system to coordinate the best course of action for your situation and notify emergency services.

The vehicle will attempt to call BMW Assist automatically in the event of a serious accident.

If the vehicle ever gets stolen, the BMW Assist service can help the police locate it. This feature may save the customer money on their insurance premium, as well as give peace of mind.

■ Automatic Collision Notification

The BMW Assist system transmits the vehicle's current location and vehicle information to the BMW Assist Response Center automatically after an airbag deploys or a severe rear impact occurs. A trained response specialist will then attempt to contact the vehicle via the hands-free telephone system, and will notify the appropriate emergency services of the location and situation, even if response is not returned to the operator/specialist.

■ **Emergency Request (SOS)**

By activating “Emergency” on the control display or pressing the “SOS” button, you transmit your location and vehicle information. A BMW Assist response specialist then speaks with you to determine the nature of your emergency and to coordinate the response to your specific assistance needs. The specialist can direct emergency services to your vehicle's location, provide you with emergency directions to the nearest hospital or police station, and even notify your emergency contacts about your situation.

■ **Enhanced Roadside Assistance**

If you experience a flat tire, run out of gas, or need any other roadside help for your vehicle, just press the “Wrench” or “Roadside Assistance” button to transmit your location and vehicle information. The BMW Assist Response Center then links you to BMW Roadside Assistance for the appropriate dispatch to your location, even if you don't know where you are.

■ **Stolen Vehicle Recovery (7 Series from 9/2005/6 Other Series from 10/04)**

If the BMW is equipped with this capability and is ever stolen, the BMW Assist Response Center can be notified by calling toll free (888) 333-6118 immediately after filing the police report.

The center can remotely activate the BMW Assist system to locate the vehicle and help the police recover it.

■ **Customer Relations**

For questions, compliments or concerns, The BMW Customer Relations department can be reached by pressing the ASSIST button or selecting customer relations from the CD/CID iDrive Menu.

7 Series drivers can also easily contact their preferred BMW center.

■ **TeleService (5, 6, & 7 Series from 2004, 3 Series from 2007)**

The vehicle's service condition (condition based service) is transmitted automatically or the customer's request to the preferred BMW center. The customer's service advisor will then call the subscriber to set up a convenient appointment.

Convenience Plan

For an addition yearly rate, the BMW ASSIST Safety Plan can be Upgraded to include the Convenience Plan.

A personal concierge is available to assist with business or personal arrangements such as making hotel or dinner reservations, buying event tickets, or even finding that perfect gift.

■ Concierge

This feature takes advantage of BMW Assist Concierge and utilize BMW's expert resources for travel arrangements, service referrals, shopping, entertainment, business outings and much more. BMW Assist Concierge addresses needs in many areas in life, not just those related to the driving experience.

The concierge service is part of the Convenience Plan and can be used at any time, from anywhere by dialing toll-free (800) 233-8896 or via <http://concierge.bmwassist.com>.

■ Directions

Pressing the “SOS” button allows the customer to contact a navigation specialist for step by step directions to a desired street address or point of interest.

If the vehicle is equipped with the iDrive based navigation system, the address and number of the location desired can be automatically downloaded to the vehicle.

■ Critical Calling

This feature allows the customer to place up to 4 operator assisted calls a year (five minute maximum allowable time). This feature is excellent in case the customer forgets their mobile phone but needs to make an urgent call to a family member or colleague.

■ Traffic

Up to-date traffic reports along the route can be obtained as well as the weather forecast locally or at the destination.

■ Weather

The BMW ASSIST operator can also help with the weather forecast of your desired destination.

Optional Services

Make hands-free personal calls with the BMW handset or an approved *Bluetooth*® phone.

■ Hands-free Personal Calling

Using an approved *Bluetooth*® cellular phone will allow the customer to call hands-free without any cords or cables getting in their way. The phone will completely integrate with the vehicle's electrical system.